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On the Refractive Indices of Gaseous Potassium, Zinc, Cadmium, Mercury, Arsenic, Selenium, and Tellurium

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that B_2O_3 increases and K_2O decreases the coefficient C_0. λ_0, on the other hand, does not seem to vary much for the range of chemical composition of the glasses in question. For such glasses, then, the dispersion of double-refraction appears roughly proportional to the stress-optical coefficient.

7. The experiments have also revealed that in one glass, for which the relation of stress to molar strain departed sensibly from linearity, the optical effect was proportional to the stress—that is to the molecular strain—and not to the molar strain; a result in accordance with what one might expect from the phenomena of double-refraction in viscous fluids in motion.

On the Refractive Indices of Gaseous Potassium, Zinc, Cadmium, Mercury, Arsenic, Selenium, and Tellurium.

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(Abstract.)

The present work forms a continuation of an enquiry begun by Mr. C. Cuthbertson* on the refractive indices of the vapours of elements not gaseous at ordinary temperatures.

The refractometer of Jamin was again employed, but tubes of fused silica were now used and other improvements introduced.

The following table exhibits the results obtained :—

Element.	Refractivities $(\mu-1)10^6$.					
	$\lambda = 6562$.	$\lambda = 5893$.	$\lambda = 5630$.	$\lambda = 5540$.	$\lambda = 5460$.	$\lambda = 5183$.
Potassium	negative	—	—	—	negative	
Zinc	1960	2050—2065	2020	—	2150 ?	2070
Cadmium	2675	2675	—	—	2725	2780
Mercury	1799*	1866	—	—	1882	1885
Arsenic	—	1552	—	—	1579	
Selenium	1520	1565	—	1560	1570	
Tellurium	2370	2495	—	—	2620	

* Subsequent work by Mr. Metcalfe renders it probable that the true value is $1\frac{1}{2}$ to 2 per cent. higher than this.—January 24, 1907.

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* 'Phil. Trans.,' A, vol. 204, p. 323, 1905.

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Dispersion.

Except in the case of potassium, the dispersion is probably normal in direction in every case, and the apparent exceptions shown in the table are to be ascribed to errors of observation.

Refraction and Refraction Equivalents.

The gaseous refractivities of zinc, cadmium, and tellurium are higher than the highest (viz., that of iodine) of which we had previous knowledge.

The gaseous refractivities are compared with the refraction equivalents of Gladstone and others in the following table :—

	Refraction equivalents.						Refractivities now found (gaseous).			
	Gladstone.		Haagen.[‡]		Kannonikoff.[§]		$(\mu-1)10^6$.			
	Early.[*]	Later.[†]	R_{α}.	R_A.	R_{α}.	R_A.	λ 6562.	λ 5893.	λ 5460.	λ 5183.
As	15·4	15·4	20·22	18·84	—	—	—	1550	1580	—
Zn	10·2	9·8	19·89	18·64	9·8	9·4	1960	2060	2150	2070
Cd	13·6	13·1	—	—	13·03	12·66	2675	2675	2725	2780
Se	—	30·5	—	—	—	—	1530	1565	1570	—
H	1·3	—	—	—	—	—	—	139	—	—

[*] ‘Journal Chem. Soc.,’ 1870, p. 101; ‘Phil. Trans.,’ 1870, p. 9.

[†] ‘American Journal of Science,’ 3, vol. 29, 1885, p. 57.

[‡] ‘Pogg. Ann.,’ vol. 131, 1867, p. 127.

[§] ‘Journal für Praktische Chemie,’ vol. 31, 1885, p. 339.

The results are very curious. Gladstone's refraction equivalent for arsenic is about 12 times that for hydrogen, while the gaseous refractivity is 11 times that of hydrogen. But the values of Gladstone for zinc and cadmium are just half those now obtained. Haagen, however, has a value for zinc which corresponds fairly well with the refractivity. Finally, Gladstone's value of selenium is about double that shown by the refractivity.

Relative Refractivities of the Elements.

The values now obtained confirm previous observations of the periodicity of this function and its connection with the atomic weight. They also strengthen the belief in an intimate connection with the valency.

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